A low threshold for North Atlantic ice rafting from “low-slung slippery” late Pliocene ice sheets

Titre	A low threshold for North Atlantic ice rafting from “low-slung slippery” late Pliocene ice sheets
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Résumé en anglais	Suborbital variability in late Pleistocene records of ice-rafted debris and sea surface temperature in the North Atlantic Ocean appears most extreme during times of enlarged ice sheets with a well-constrained benthic oxygen isotope-defined “ice volume threshold” (δ18OT) for the “100 ka (inter)glacial” world. Information on climate instability for the earlier Pleistocene and late Pliocene is more fragmentary and/or of much lower temporal resolution, but the data available suggest similar behavior with δ18OT remaining more or less constant over the past 3000 ka. This finding is puzzling because it implies that ice rafting is highly sensitive to ice volume on short (suborbital/glacial-interglacial) time scales but not to the long-term changes in ice sheet composition associated with intensification of Northern Hemisphere glaciation (NHG). Here we report new high-resolution records of stable isotope change and ice rafting in the North Atlantic at Integrated Ocean Drilling Program Site U1308 (reoccupation of Deep Sea Drilling Project Site 609) during two glacials key to intensification of NHG (marine isotope stages G4, ~2640 ka, and 100, ~2520 ka). We find a pattern of suborbital ice rafting events showing clear evidence of threshold behavior. However, contrary to previous reports, we find that δ18OT for the late Pliocene is up to 0.45‰ Vienna Peedee belemnite (VPDB) lower than for the late Pleistocene. Using published Plio-Pleistocene global sea level records, we evaluate different potential explanations for this finding. We conclude that the observed Pliocene-Pleistocene offset in δ18OT is attributable to the existence of low-slung Pliocene ice sheets that flowed more readily than their late Pleistocene counterparts, associated with a smaller contemporaneous continental ice volume and less isotopically depleted ice.
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